SOLAR/1034-79/05

Monthly Performance Report

ALPHA CONSTRUCTION CO.

MAY 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

MONTHLY PERFORMANCE REPORT

ALPHA CONSTRUCTION COMPANY

MAY 1979

I. SYSTEM DESCRIPTION

The Alpha Construction Company site is a single-family residence in Canton, Ohio. Solar energy is used for space heating the home and preheating domestic hot water (DHW). The solar energy system has an array of flat-plate collectors with a gross area of 428 square feet. The array faces south at an angle of 37 degrees to the horizontal. Air is the transfer medium that delivers solar energy from the collector array to storage and to the space heating and hot water loads. Solar energy is stored in the basement in a 510-cubic-foot bin containing 50,100 pounds of rock. The bin has concrete block walls and polyurethane insulation. Preheated city water is stored in an 80-gallon preheat storage tank and supplied, on demand, to a conventional 52-gallon DHW tank. When solar energy is insufficient to satisfy the space heating load, a heat pump in the air-handling unit provides auxiliary energy for space heating. Similarly, an electrical heating element in the DHW tank provides auxiliary energy for water heating. The system, shown schematically in Figure 1, has four modes of solar operation.

Mode 1 - Collector-to-Space Heating: This mode activates when the collector is operating, a space heating demand exists, and the plenum temperature at the top of storage is above the minimum value suitable for supplying heat to the house. Collection begins when the temperature at the top of the collector is higher by a minimum amount than the temperature in the plenum at the bottom of storage. Heated air is passed through the plenum at the top of storage and circulated through the house by the heat pump air-handling unit before being returned to the collector.

Mode 2 - Collector-to-Storage: This mode activates when the collector is operating and there is either no demand for space heating or the plenum

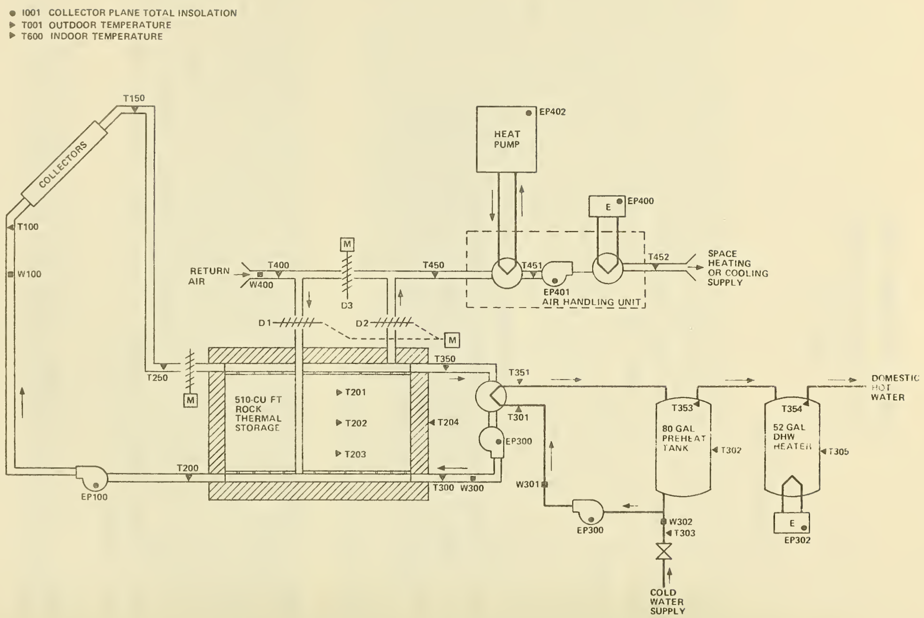

Figure 1. ALPHA CONSTRUCTION CO. SOLAR ENERGY SYSTEM SCHEMATIC

temperature at the top of storage is below the minimum value for supplying heat to the house.

Mode 3 - Storage-to-Space Heating: This mode activates when there is a demand for space heating, and the plenum temperature at the top of storage is above the minimum value for supplying heat to the house. The fan in the air-handling unit draws air from the bin, circulating it through the house and back to storage.

Mode 4 - Domestic Water Preheating: This mode activates when the collector is operating and when the temperature at the top of the collector indicates a minimum value for hot water heating, which must be above the plenum temperature at the bottom of storage.

II. PERFORMANCE EVALUATION

INTRODUCTION

The site was unoccupied in May and the solar energy system operated continuously during the month. Total solar energy collected was 4.2 million Btu and the total solar energy used was 0.43 million Btu or 10 percent of the collected energy. The change in stored energy was 0.069 million Btu and the total system losses amounted to 3.7 million Btu. Solar energy satisfied 88 percent of the space heating requirements. There was no demand for hot water during the month. The solar energy system incurred an electrical energy expense of 0.55 million Btu.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 19.0 million Btu for a daily average of 1432 Btu per square foot. This was

below the estimated average daily solar radiation for this geographical area during May of 1533 Btu per square foot for a south-facing plane with a tilt of 37 degrees to the horizontal. The average ambient temperature during May was 58°F as compared with the long-term average for May of 59°F. The number of heating degree-days for the month (based on a 65°F reference) was 274, as compared with the long-term average of 231. The number of cooling degree-days was 43, as compared with the average of 36.

THERMAL PERFORMANCE

System - During May the solar energy system performed somewhat poorer than expected. The expected performance was determined from a modified f-chart analysis using measured weather and subsystem loads as input. Solar energy used by the system was estimated by assuming that all energy collected would be applied to the load. Actual solar energy used was 0.43 million Btu versus an estimated 0.7 million Btu. System total solar fraction was 88 percent versus an estimated 100 percent.

Collector - The total incident solar radiation on the collector array for the month of May was 19.0 million Btu. During the period the collector loop was operating, the total insolation amounted to 17.2 million Btu. The total collected solar energy for the month of May was 4.2 million Btu, resulting in a collector array efficiency of 22 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 3.8 million Btu, while solar energy delivered from the collector array directly to the loads amounted to 0.18 million Btu. Energy loss during transfer from the collector array to storage and loads was 0.24 million Btu. This loss represented 6 percent of the energy collected. Operating energy required by the collector loop was 0.37 million Btu.

Storage - Solar energy delivered to storage was 3.8 million Btu. There were 0.25 million Btu delivered from storage to the space heating subsystem. Energy

loss from storage was 3.5 million Btu. This loss represented 92 percent of the energy delivered to storage. The storage efficiency was 8 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 113°F.

DHW Load - Because the home was unoccupied in May, there was no demand for hot water. A total of 0.18 million Btu of solar energy was used to heat the water in the preheat tank. The DHW subsystem consumed a total of 0.27 million Btu of operating energy, resulting in an electrical energy expense of 0.27 million Btu. An additional 0.26 million Btu of auxiliary electrical energy were used by the hot water tank to maintain the temperature. The average temperature of the water in the DHW tank was 119°F.

Space Heating Load - The measured space heating load for the unoccupied home during May was 0.29 million Btu. The solar energy system provided 0.25 million Btu. The remaining load of 0.035 million Btu was satisfied by an auxiliary electrical heat pump and an electrical heating element at an electrical energy consumption of 0.011 million Btu. The space heating subsystem consumed an additional 0.036 million Btu of operating energy. A net electrical energy savings of 0.096 million Btu were obtained from the solar portion of the space heating subsystem.

OBSERVATIONS

The solar energy site was unoccupied during May and presented a minimum space heating load due to a low thermostat setting of 62°F and relatively mild ambient temperature. More solar energy than required was collected to satisfy the space heating load. The uncontrolled energy escape from storage of 3.5 million Btu into the conditioned space and the outside environment caused electrical energy to be expended for 12 percent of the space heating load by the auxiliary heat pump.

During the month, the collector air-flow sensor (W100) continued to read lower values of air flow than previously measured. The cause for this reduced air flow remains undetermined; however, a faulty sensor is suspected. Therefore, collected energy for the month may be slightly higher than stated in the attached report. The losses from storage would be increased by the same amount, since the measured energy delivered to the load is not affected.

The DHW preheat loop expended more operating energy than the amount of solar energy transferred to the DHW preheat tank. The configuration of the DHW preheat loop permits solar energy transfer to the preheat tank only when collection is occurring. A separate air blower is required by this subsystem and adds significantly to operating costs. Frequently the heated air from the collector at the beginning or end of the collection period is cooler than the temperature of the water in the preheat tank. The operation of the preheat loop, which is independent of the water temperature in the tank, extracts energy from the tank during these periods. During periods of heating from storage, an induced air flow occurs through the DHW loop. A portion of the unmeasurable energy loss from storage may escape through this air path. During the cooling season the storage subsystem must be operated in order to operate the DHW preheat loop and energy that is not used by the DHW subsystem is collected in storage. However, the energy losses from storage transfer into the conditioned space and add to the space cooling loads. These energy losses reduce the energy savings obtained by the DHW subsystem.

ENERGY SAVINGS

The solar energy system incurred a total electrical energy expense of 0.55 million Btu. The space heating subsystem provided an electrical energy savings of 0.096 million Btu, but this was eliminated due to the expense of operating the DHW subsystem (0.27 million Btu) and the collection subsystem (0.37 million Btu).

III. ACTION STATUS

Boeing conducted a preliminary air-mapping survey in October which revealed significant leaks in the energy collection and storage subsystems. Sealing the accessible leaks would only provide minimal improvement.

Boeing has been advised of the reduced air-flow measurements of W100. A schedule for corrective action has not been established.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: ALPHA CONSTRUCTION COMPANY — SOLAR/1034-79/05
REPORT PERIOD: MAY,1979

SITE/SYSTEM DESCRIPTION:
THE SOLAR ENERGY SYSTEM PROVIDES FOR SPACE HEATING OF A SINGLE FAMILY DWELLING. THE SYSTEM ALSO PROVIDES ENERGY TO AN 80 GALLON HOT WATER PREHEAT TANK. STORAGE IS 510 CUBIC FEET OF GRAVEL. A HEAT PUMP AND ELECTRIC STRIP HEATERS PROVIDE AUXILIARY SPACE HEATING.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	19.011	MILLION BTU
	44377	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	4.234	MILLION BTU
	9883	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	58	DEGREES F
AVERAGE BUILDING TEMPERATURE	70	DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.02	
ECSS OPERATING ENERGY	0.373	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	0.682	MILLION BTU
TOTAL ENERGY CONSUMED	5.182	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	0.000	0.287	N.A.	0.287	MILLION BTU
SOLAR FRACTION	2	88	N.A.	88	PERCENT
SOLAR ENERGY USED	0.182	0.252	N.A.	0.434	MILLION BTU
OPERATING ENERGY	0.274	0.036	N.A.	0.682	MILLION BTU
AUX. THERMAL ENERGY	0.255	0.008	N.A.	0.263	MILLION BTU
AUX. ELECTRIC FUEL	0.255	0.011	N.A.	0.266	MILLION BTU
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A.	MILLION BTU
ELECTRICAL SAVINGS	-0.274	0.096	N.A.	-0.551	MILLION BTU
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A.	MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.091

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SOLAR/1034-79/05

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GENERAL SITE DATA:	
INCIDENT SOLAR ENERGY	20.057 GIGA JOULES
	503947 KJ/SQ.M.
COLLECTED SOLAR ENERGY	4.467 GIGA JOULES
	112231 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	14 DEGREES C
AVERAGE BUILDING TEMPERATURE	21 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.02
ECSS OPERATING ENERGY	0.393 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	0.720 GIGA JOULES
TOTAL ENERGY CONSUMED	5.467 GIGA JOULES

SUBSYSTEM SUMMARY:	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	0.000	0.303	N.A.	0.303 GIGA JOULES
SOLAR FRACTION	2	88	N.A.	88 PERCENT
SOLAR ENERGY USED	0.192	0.266	N.A.	0.458 GIGA JOULES
OPERATING ENERGY	0.289	0.038	N.A.	0.720 GIGA JOULES
AUX. THERMAL ENG	0.269	0.009	N.A.	0.277 GIGA JOULES
AUX. ELECTRIC FUEL	0.269	0.012	N.A.	0.281 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
ELECTRICAL SAVINGS	-0.289	0.101	N.A.	-0.581 GIGA JOULES
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. GIGA JOULES
SYSTEM PERFORMANCE FACTOR:		0.091		

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
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REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28, 1978. SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: ALPHA CONSTRUCTION COMPANY
REPORT PERIOD: MAY,1979

SOLAR/1034-79/05

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	0.961	45	0.044	N	0.017	N	0.046
2	0.978	54	0.034	O	0.016	O	0.035
3	0.102	57	-0.000	T	0.002	T	-0.002
4	0.170	42	0.047		0.003		0.275
5	0.818	45	0.043	A	0.017	A	0.052
6	0.948	55	0.024	P	0.017	P	0.026
7	1.187	71	0.014	P	0.021	P	0.012
8	0.909	72	0.009	L	0.016	L	0.010
9	0.814	75	0.013	I	0.016	I	0.015
10	0.533	73	0.004	C	0.015	C	0.007
11	0.785	75	0.009	A	0.017	A	0.011
12	0.603	64	0.011	B	0.010	B	0.018
13	0.381	52	-0.001	L	0.011	L	-0.002
14	0.914	59	0.014	E	0.016	E	0.015
15	0.756	57	0.007		0.015		0.010
16	0.976	51	0.009		0.016		0.009
17	0.977	53	0.009		0.016		0.009
18	0.989	61	0.011		0.016		0.012
19	0.736	65	0.006		0.014		0.008
20	0.730	67	0.011		0.014		0.014
21	0.711	60	0.006		0.015		0.008
22	0.751	53	0.003		0.015		0.004
23	0.237	56	-0.001		0.006		-0.004
24	0.040	52	0.000		0.000		0.000
25	0.053	45	0.035		0.000		0.657
26	0.136	44	0.037		0.000		0.276
27	0.325	51	0.024		0.008		0.075
28	0.201	54	-0.000		0.008		-0.002
29	0.626	56	0.011		0.014		0.018
30	0.360	58	0.001		0.014		0.002
31	0.253	62	0.001		0.009		0.002
SUM	19.011	-	0.434	N.A.	0.373	N.A.	-
AVG	0.613	58	0.014	N.A.	0.012	N.A.	0.023
NBS ID	G001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: ALPHA CONSTRUCTION COMPANY — SOLAR/1034-79/05
REPORT PERIOD: MAY, 1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	0.961	0.920	0.292	53	0.304
2	0.978	0.921	0.279	64	0.286
3	0.102	0.022	0.003	59	0.032
4	0.170	0.040	0.004	44	0.024
5	0.818	0.772	0.220	53	0.268
6	0.948	0.910	0.250	65	0.264
7	1.187	1.159	0.306	77	0.258
8	0.909	0.869	0.219	82	0.241
9	0.814	0.769	0.202	*	0.248
10	0.533	0.491	0.115	78	0.216
11	0.785	0.750	0.182	84	0.232
12	0.603	0.543	0.138	76	0.228
13	0.381	0.297	0.050	57	0.132
14	0.914	0.859	0.194	68	0.212
15	0.756	0.703	0.150	65	0.199
16	0.976	0.923	0.203	61	0.208
17	0.977	0.921	0.202	65	0.206
18	0.989	0.929	0.213	75	0.216
19	0.736	0.657	0.135	74	0.184
20	0.780	0.738	0.166	77	0.212
21	0.711	0.658	0.138	66	0.194
22	0.751	0.676	0.139	61	0.185
23	0.237	0.136	0.019	63	0.079
24	0.040	0.000	0.000	52	0.000
25	0.053	0.000	0.000	44	0.000
26	0.136	0.000	0.000	44	0.000
27	0.325	0.270	0.084	54	0.257
28	0.201	0.144	0.033	57	0.162
29	0.626	0.585	0.178	63	0.284
30	0.360	0.296	0.074	63	0.206
31	0.253	0.190	0.046	69	0.180
SUM	19.011	17.150	4.234	-	-
AVG	0.613	0.553	0.137	64	0.223
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: ALPHA CONSTRUCTION COMPANY SOLAR/1034-79/05
REPORT PERIOD: MAY,1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.280	0.034	0.167	98	0.718
2	0.262	0.025	0.089	109	0.432
3	0.003	0.000	-0.087	111	-28.224
4	0.004	0.047	-0.188	101	-36.037
5	0.212	0.036	0.109	92	0.679
6	0.232	0.013	0.132	105	0.623
7	0.276	0.000	0.131	118	0.476
8	0.196	0.000	0.064	124	0.327
9	0.178	0.003	0.036	128	0.221
10	0.098	0.000	-0.065	126	-0.657
11	0.160	0.000	0.027	125	0.172
12	0.118	0.000	-0.007	128	-0.059
13	0.043	0.000	-0.089	121	-2.062
14	0.170	0.002	0.044	119	0.272
15	0.131	0.000	0.003	122	0.021
16	0.181	0.000	0.052	124	0.288
17	0.177	0.000	0.027	127	0.150
18	0.186	0.000	0.035	130	0.189
19	0.116	0.000	-0.040	130	-0.346
20	0.143	0.000	-0.001	129	-0.005
21	0.118	0.000	-0.030	127	-0.255
22	0.122	0.000	-0.029	124	-0.236
23	0.015	0.000	-0.089	120	-6.135
24	0.000	0.000	-0.103	113	1.000
25	0.000	0.035	-0.145	101	1.000
26	0.000	0.037	-0.146	86	1.000
27	0.081	0.020	0.054	81	0.918
28	0.033	0.000	0.006	85	0.186
29	0.164	0.000	0.134	92	0.817
30	0.068	0.000	0.001	97	0.009
31	0.042	0.000	-0.023	97	-0.547
SUM	3.813	0.252	0.069	-	-
AVG	0.123	0.008	0.002	113	0.084
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: ALPHA CONSTRUCTION COMPANY
REPORT PERIOD: MAY,1979

SOLAR/1034-79/05

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.000	0	0.010	0.013	0.009	0.009	N	-0.013	N	52	119	0
2	0.000	0	0.010	0.012	0.009	0.009	O	-0.012	O	52	119	0
3	0.000	0	-0.000	0.001	0.009	0.009	T	-0.001	T	52	119	0
4	0.000	0	-0.000	0.001	0.008	0.008		-0.001		52	119	0
5	0.000	0	0.007	0.013	0.009	0.009	A	-0.013	A	52	119	0
6	0.000	0	0.011	0.012	0.008	0.008	P	-0.012	P	52	119	0
7	0.000	0	0.014	0.016	0.010	0.010	P	-0.017	P	52	119	0
8	0.000	0	0.009	0.012	0.008	0.008	L	-0.012	L	52	119	0
9	0.000	0	0.009	0.012	0.008	0.008	I	-0.012	I	52	119	0
10	0.000	0	0.004	0.012	0.008	0.008	C	-0.012	C	52	119	0
11	0.000	0	0.009	0.012	0.009	0.009	A	-0.012	A	52	119	0
12	0.000	0	0.011	0.008	0.006	0.006	B	-0.008	B	52	119	0
13	0.000	0	-0.001	0.007	0.008	0.008	L	-0.007	L	52	119	0
14	0.000	2	0.012	0.012	0.008	0.008	E	-0.012	E	52	119	0
15	0.000	0	0.007	0.011	0.009	0.009		-0.011		52	119	0
16	0.000	0	0.009	0.012	0.008	0.008		-0.012		52	119	0
17	0.000	0	0.009	0.012	0.007	0.007		-0.012		52	119	0
18	0.000	0	0.011	0.012	0.008	0.008		-0.012		52	119	0
19	0.000	0	0.006	0.010	0.009	0.009		-0.010		52	119	0
20	0.000	0	0.011	0.011	0.007	0.007		-0.011		52	119	0
21	0.000	0	0.006	0.012	0.008	0.008		-0.012		52	119	0
22	0.000	0	0.003	0.011	0.008	0.008		-0.011		52	119	0
23	0.000	0	-0.001	0.003	0.008	0.008		-0.003		52	119	0
24	0.000	0	0.000	0.000	0.007	0.007		0.000		52	119	0
25	0.000	0	0.000	0.000	0.008	0.008		0.000		52	119	0
26	0.000	0	0.000	0.000	0.009	0.009		0.000		52	119	0
27	0.000	0	0.005	0.006	0.009	0.009		-0.006		52	119	0
28	0.000	0	-0.000	0.006	0.009	0.009		-0.006		52	119	0
29	0.000	0	0.011	0.011	0.007	0.007		-0.011		52	119	0
30	0.000	0	0.001	0.007	0.009	0.009		-0.007		52	119	0
31	0.000	0	0.001	0.007	0.008	0.008		-0.007		52	119	0
SUM	0.000	-	0.182	0.274	0.255	0.255	N.A.	-0.274	N.A.	-	-	0
AVG	0.000	2	0.006	0.009	0.008	0.008	N.A.	-0.009	N.A.	52	119	0
NBS	Q302	N300	Q300	Q203	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: ALPHA CONSTRUCTION COMPANY
REPORT PERIOD: MAY,1979

SOLAR/1034-79/05

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.039	89	0.034	0.005	0.001	0.001	N	0.013	N	65	45
2	0.025	100	0.025	0.002	0.000	0.000	O	0.010	O	66	54
3	0.000	0	0.000	0.000	0.000	0.000	T	0.000	T	66	57
4	0.060	78	0.047	0.008	0.003	0.004		0.018		63	42
5	0.047	75	0.036	0.007	0.003	0.004	A	0.012	A	64	45
6	0.013	100	0.013	0.001	0.000	0.000	P	0.005	P	66	55
7	0.000	0	0.000	0.000	0.000	0.000	P	0.000	P	72	71
8	0.000	0	0.000	0.000	0.000	0.000	L	0.000	L	77	72
9	0.003	100	0.003	0.000	0.000	0.000	I	0.002	I	78	75
10	0.000	0	0.000	0.000	0.000	0.000	C	0.000	C	79	73
11	0.000	100	0.000	0.000	0.000	0.000	A	0.000	A	80	75
12	0.000	0	0.000	0.000	0.000	0.000	B	0.000	B	79	64
13	0.000	0	0.000	0.000	0.000	0.000	L	0.000	L	72	52
14	0.002	100	0.002	0.000	0.000	0.000	E	0.001	E	70	59
15	0.000	0	0.000	0.000	0.000	0.000		0.000		72	57
16	0.000	0	0.000	0.000	0.000	0.000		0.000		69	51
17	0.000	0	0.000	0.000	0.000	0.000		0.000		68	53
18	0.000	0	0.000	0.000	0.000	0.000		0.000		71	61
19	0.000	0	0.000	0.000	0.000	0.000		0.000		74	65
20	0.000	0	0.000	0.000	0.000	0.000		0.000		77	67
21	0.000	0	0.000	0.000	0.000	0.000		0.000		77	60
22	0.000	0	0.000	0.000	0.000	0.000		0.000		72	53
23	0.000	0	0.000	0.000	0.000	0.000		0.000		69	56
24	0.000	0	0.000	0.000	0.000	0.000		0.000		66	52
25	0.035	100	0.035	0.003	0.000	0.000		0.014		62	45
26	0.037	100	0.037	0.004	0.000	0.000		0.015		62	44
27	0.020	100	0.020	0.003	0.000	0.000		0.007		62	51
28	0.000	0	0.000	0.000	0.000	0.000		0.000		63	54
29	0.006	6	0.000	0.001	0.001	0.002		0.000		65	56
30	0.000	0	0.000	0.000	0.000	0.000		0.000		67	58
31	0.000	0	0.000	0.000	0.000	0.000		0.000		68	62
SUM	0.287	-	0.252	0.036	0.008	0.011	N.A.	0.096	N.A.	-	-
AVG	0.009	88	0.008	0.001	0.000	0.000	N.A.	0.003	N.A.	70	58
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: ALPHA CONSTRUCTION COMPANY
REPORT PERIOD: MAY,1979

SOLAR/1034-79/05

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	2244	N	45	53	N	N	N
2	2284	O	54	64	O	O	C
3	238	T	57	59	T	T	T
4	396		42	44			
5	1910	A	45	53	A	A	A
6	2214	P	55	65	P	P	P
7	2770	P	71	77	P	P	P
8	2122	L	72	82	L	L	L
9	1900	I	75	*	I	I	I
10	1245	C	73	78	C	C	C
11	1832	A	75	84	A	A	A
12	1407	B	64	76	B	B	B
13	890	L	52	57	L	L	L
14	2134	E	59	68	E	E	E
15	1766		57	65			
16	2278		51	61			
17	2280		53	65			
18	2309		61	75			
19	1719		65	74			
20	1821		67	77			
21	1659		60	66			
22	1753		53	61			
23	554		56	63			
24	94		52	52			
25	123		45	44			
26	317		44	44			
27	759		51	54			
28	470		54	57			
29	1462		56	63			
30	840		58	63			
31	590		62	69			
SUM	44377	N.A.	-	-	-	-	-
AVG	1432	N.A.	58	64	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

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